#5 K Cooper 4/28/03

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ENCLOSURES (Check all that apply)

- ☐ Fee Transmittal Form
- ☐ Fee Attached
- ☒ Amendment/Reply
- ☐ After Final
- ☐ Affidavits/declaration(s)
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- ☐ Information Disclosure Statement
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Remarks

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1st Response To Patent Examiner – Inkwell Products, Inc 4-18-03
By: Mark Atkins

Dear Mr. Campbell.

Below I have responded to your comments about our patent application. The first two sections contrast our patent application to the two patents you noted. The third section discusses the intended protection of our claims and revised claims.

Please call me after you have had a chance to review (630) 677-9233

Patent #4,756,091 – Herbert Van Denend

Arguments as to why our design is novel to this patent:

The Van Denend patent describes a hybrid oven that uses an infra-red heat element and high velocity heated air to heat the substrate.

Van Denend incorporates a heating element for the purpose of emitting infra-red radiation as a means of energy transfer to the substrate being dried. The nature of this process differs substantially from Inkwell Products applications where the heat energy is first passed to an air stream moving past a specially designed heat exchanger. The air stream is then impinged upon the substrate being dried where it then transfers its stored heat energy for the process of drying. The heat element described by Van Denend, although similar in construction to the heating element described in Inkwell Product's application, incorporates different materials such as quartz tubes versus stainless steel sheaths to maximize the efficiency of radiating infra-red energy.

In Van Denend's design, the infra-red-heating element is located immediately above the substrate and radiates infra-red energy onto the web. The temperature of the element is at a substantially higher temperature than both the oven and the web temperature as noted in Patent 4,756,091 Column 5 lines 55-60. The substantial difference in the element's surface temperature raises substrate temperature quickly as it passes by thermal radiation. Processes in the printing and coating industries use either water-based or solvent-based inks and/or coatings. Since the heat source in Van Denend's design is exposed to the environment, this technology is limited to non-hazardous environments only (i.e. water based processes).

In comparison, the Inkwell Products design has the heating element buried in the middle of the air distribution system, therefore heat cannot radiate directly from the heating element to the web. In operation, the bottom surface of the air distribution system heats up to approximately equal that of the temperature of the oven. Energy transfer via thermal radiation is factually insignificant to the invention and drying process. Since the heat source in located within the air distribution system and air is always being project

outward, the device is considered to be in a sealed pressurized vessel and therefore can be operated in hazardous environments.

In Van Denend's design, the high velocity heated air is preheated by a remote gas burner, then gathered in a remote plenum, and then travels through ductwork where it eventually is dispersed onto the web. A blower moves the heated air through this system. This system is made up of large and bulky components that take up a lot of floor space and that are expensive to both fabricate and install. The system is also not very efficient in operation for two reasons. First because the heated air travels such a long distance before it is impinged onto the substrate. Secondly, it is well known that large volumes of air are required to for the system to achieve an acceptable level of drying.

In comparison, the InkWell Products technology is very compact and efficient in that the air is heated just prior to being dispersed onto the web. The air distribution system is internally designed so that the air runs through a maze of air passages and consequently continues to increase in temperature as it moves toward the discharge orifices. All this is accomplished in a single compact assembly that can be treated as a single component (i.e. the air distribution system). Since this system is all-inclusive in a single component, it lends it self to being modularized and for applications where space is limited.

Also in comparison, the Inkwell Products system uses air that is supplied by an air compressor not a blower. Two benefits are received by using compressed air. First, much higher impinging velocities of the heated air on the substrate are achieved. It has been shown that when using compressed air, the air exiting the air distribution system is at sonic velocity (65,000 to 85,000 feet per minute), which is substantially higher velocity than Van Denend's can achieve using a blower – shown to be limited to approximately 10,000 to 12,000 feet per minute. This extra high velocity air significantly increases the heat transfer coefficient for convection, thus allowing the heat to enter the substrate at a much higher rate. Since the air is passing through very small round orifices instead of slots, less air volume is consumed thereby making this invention an economically viable process. Secondly, the process of compressing the air removes moisture thus it more readily absorbs the moisture being driven out of the substrate. On average, the combinations of these benefits have proven to increase press line speeds by 40%.

Patent #5,937,535 – Hoffman Jr.

Generally speaking, Hoffman never specifically discusses the means for heating the substrate within his dryer. Hoffman seems to be primarily focused on using sensors appropriately to achieve a consistent drying environment in an oven, whereas the InkWell Products patent application focuses on the technology that accomplishes the actual drying. Hoffman does not discuss heat source, airflow, type of heat transfer (i.e. convection, conduction, IR), etc.

In reference to your comment:
"Hoffman Jr. et al. discloses a forced air drying unit comprising a housing, an inlet cavity, a baffle, air passages, a single or multiple orifice chamber, and a series of orifices allowing air to pass from said orifice chamber to the exterior of the housing, an electrical cartridge heater mounted within the housing, and having a means for controlling the temperature of the material comprising thermocouple."

Hoffman may have some or all of these components in his design, as does Van Denend, but uses them in a substantially different way. In the referenced designs, these components are of sheet metal construction and make up the overall construction of the dryer in which the substrate passes through, whereas as in our design, the similar components make up only the "nozzle" of the dryer.

Our design uses orifices, whereas Hoffman describes his system with "air knives (with slits therein)." Since he is using slits and not orifices, he is pushing substantially more volume of air through his system, which means he is also using a blower not compressed air. Same argument for the blower applies from Van Denend patent above.

Hoffman discusses a humidifier, chiller, conveyor, air purging system, and ductwork. Our design does not use any of these components.

I have specifically commented below for each of Hoffman's claims in comparison to our design.

Claim #1 – We do not claim a conveyor or multiple sensors within the oven/dryer. Our design only uses a single temperature sensor to provide a means for controlling temperate. The terms "entrance" an "exit" refer to an openings in the dryer housing for which the substrate may pass through, not opening is the "nozzle". We do not claim a dryer entrance and/or exit openings.

Claim #2 to #4 – Hoffman claims an infra-red sensor, whereas we use a thermocouple that senses temperature through means of conduction.

Claim #5 – We do not claim an air purging of any type, especially in relation to the sensor.

Claim #6 & #7 – Hoffman's patent describes a housing for the sensor. We do not have such a housing. Our sensor is mounted directly to a flat plate.